

# 公開実用平成 3-61304

②日本国特許庁 (JP)

①実用新案出願公開

④公開実用新案公報 (U) 平3-61304

③Int. Cl.<sup>1</sup>

H D1 C 10/00  
10/10

識別記号

序内整理番号

B 2117-5E  
Z 2117-5E

⑤公開 平成3年(1991)6月17日

審査請求 未請求 請求項の数 1 (全頁)

⑥考案の名称 可変抵抗器

⑦実願 平1-122957

⑧出願 平1(1989)10月20日

⑨考案者 河島 広一 神奈川県茅ヶ崎市浜見平13-5-306

⑩出願人 横浜ゴム株式会社 東京都港区新橋5丁目36番11号

⑪代理人 井理士 吉田 精孝

明細書

1. 考案の名称

可変抵抗器

2. 実用新案登録請求の範囲

弾性材料からなる作動体の被押圧部の押圧変形  
に伴って電極部の導通抵抗が変化する抵抗器本体  
と、被押圧部を押圧可能な押圧部を備えた操作体  
とからなる可変抵抗器において、  
5

作動体の被押圧部に隣接して、被押圧部よりも  
高さ寸法が大きく、且つ上端を操作体の押圧部に  
10  
当接する弾性材料からなるガタ防止用突起を立設  
した

ことを特徴とする可変抵抗器。

3. 考案の詳細な説明

(産業上の利用分野)

15

本考案は、操作体を介しての被押圧部の押圧変形  
に伴って電極部の導通抵抗が変化する可変抵抗器の改良に関し、特に操作体のガタつきを防止で  
きる可変抵抗器に関するものである。

(従来の技術)

- 1 -

28

実開3- 61304

# 公開実用平成 3-61304

従来、この種の可変抵抗器として第4図に示すものが知られている。

この可変抵抗器は2つの電極部を有するシーツタイプのもので、抵抗器本体20と、押圧操作用の操作体30とから構成されている。  
5

抵抗器本体20は、押圧操作を受ける作動体21と、押え板22と、基板23とからなる。

作動体21は合成ゴム等の弾性材料から矩形板状に形成され、山形の被押圧部21aをその上面に2個有している。各被押圧部21aは上端を平坦に形成されており、その上面中央に操作体30のガタを防止するための突起21a1を有している。また、作動体21の下面側には、導電ゴム等からなる円板状の導電部21bが各尖部と対応して同軸上に付設されている。  
10

押え板22は作動体21の上面を囲うもので、各被押圧部21aが押通する孔22aを上面に有し、且つ作動体21の上面周縁に当接する押え面22bを内側に有している。また、押え板22の下面には基板23の厚さよりも長い係止ピン22  
15

c が複数本形成されている。

基板 23 はプリント配線板等からなり、その上面に、作動体 21 の導電部 21b が接触可能な電極部 23a を 2箇所に有している。この電極部 23a としては、一対の電極の上面に感圧導電ゴム等の感圧導電材を付設したものが使用されている。また、基板 23 には抑え板 22 の係止ピン 22c が挿入可能な係止孔 23b が形成されている。

この抵抗器本体 20 は、作動体 21 を基板 23 上に載置し、該作動体 21 を覆うようにして抑え板 22 の係止ピン 22c を基板 23 の係止孔 23b に挿入し、基板 23 の下面から突出した係止ピン 22c の突出部分を溶融または圧潰して抑え板 22 を基板 23 に固定することで組立てられる。この組立状態において作動体 21 は抑え板 22 と基板 23 との間で不動に挟持され、作動体 21 の導電部 21b と基板 23 の電極部 23a とは接触している。

一方、操作体 30 は、抵抗器本体 20 の上方において、中央下部に設けられた軸 31 を図示省略

# 公開実用平成 3-61304

のプラケット等によって回転自在に軸支されている。また、操作体 30 は作動体 21 の各被押圧部 21a に夫々対応する押圧部 32 を下面に有しており、各押圧部 32 には非押圧状態で被押圧部 21a 上面のガタ防止用突起 21a1 が夫々当接している。5

このように構成された可変抵抗器では、操作体 30 の軸 31 を中心とする傾動によって作動体 21 の被押圧部 21a が下方に押圧されて変形した時に、該押圧力に伴って電極部 23a の導通抵抗が変化するようになっている。10

（考案が解決しようとする課題）

ところで、従来の可変抵抗器では、操作体 30 を取付けた状態で、該操作体 30 の押圧部 32 と作動体 21 の被押圧部 21a との間に形成される隙間を、ガタ防止用突起 21a1 によって吸収させているが、該突起 21a1 を被押圧部 21a の上面（被押圧面）に形成しているため、突起自体の高さ寸法にプラス側の誤差があると被押圧部 21a が非押圧状態で不当な押圧力を受け、可変抵  
15

抗器に所期の抵抗変化を得られなくなるという問題点があった。また、突起自体の高さ寸法にマイナス側の誤差があるとそれまでと同様に隙間が形成されて操作体30にガタつきを生じるという問題点があった。

本考案は前記問題点に鑑みてなされたもので、その目的とするところは、可変抵抗器の抵抗値特性に支障を生じることなく、操作体のガタつきを確実に防止できる可変抵抗器を提供することにある。

#### (課題を解決するための手段)

本考案は前記目的を達成するために、弾性材料からなる作動体の被押圧部の押圧変形に伴って電極部の導通抵抗が変化する抵抗器本体と、被押圧部を押圧可能な押圧部を備えた操作体とからなる可変抵抗器において、作動体の被押圧部に隣接して、被押圧部よりも高さ寸法が大きく、且つ上端を操作体の押圧部に当接する弾性材料からなるガタ防止用突起を立設している。

#### (作用)

# 公開実用平成 3-61304

本考案によれば、被押圧部とは異なる位置に、  
被押圧部よりも高さ寸法が大きく、且つ上端を操作  
体の押圧部に当接する弾性材料からなるガタ防  
止用突起を立設しているので、該突起の高さ寸法  
をマイナス側の誤差分を考慮して大きめに形成し  
ておいても、操作体の非押圧状態において被押圧  
部に不当な押圧力が加わることがない。 5

## (実施例)

第1図乃至第3図は本考案をシーソータイプの  
可変抵抗器に適用した実施例を示すもので、第1 10  
図は可変抵抗器の断面図、第2図は抵抗器本体の  
上面図、第3図は動作説明図である。

第1図及び第2図に示した本実施例の可変抵抗  
器は、抵抗器本体1と、押圧操作用の操作体10  
とから構成されている。 15

抵抗器本体1は、押圧操作を受ける作動体2と、  
抑え板3と、基板4とからなる。

作動体2は合成ゴム等の弾性材料から矩形板状  
に形成され、上端が平坦な山形の被押圧部2aを  
その上面に2個有している。また、作動体2の下

面側には、導電ゴム等からなる円錐状の導電部 2 b が各突部 2 a に対応して同軸上に付設されている。更に、作動体 2 の上面には、各被押圧部 2 a に隣接して、被押圧部 2 a よりも高さ寸法の大きなガタ防止用の棒状突起 2 c が尖々垂直に、且つ 5 作動体 2 と一緒に立設されている。

抑え板 3 は作動体 2 の上面を覆うもので、各被押圧部 2 a 及び各棒状突起 2 c が押通する略円形の孔 3 a を上面に有し、且つ作動体 2 の上面に当接する抑え面 3 b を内側に有している。また、押え板 3 の各辺尖々には、基板 4 の厚さよりも長く、且つ下端に鉤形係止部を有する係合片 3 c が垂設されている。 10

基板 4 はプリント配線板等からなり、その上面に、作動体 2 の導電部 2 b が接触可能な電極部 4 a を 2箇所に有している。この電極部 4 a としては、半円形の 2 個の抵抗膜を非接触状態で配置し、且つ各抵抗膜に電極を接続したものが使用されている。また、基板 4 には、抑え板 3 の係合片 3 c が挿入及び係合可能な係止孔 4 b が、各係合片に 15

# 公開実用平成 3-61304

対応して形成されている。

この抵抗器本体1は、作動体2を基板4上に載置し、該作動体2を覆うようにして抑え板3の係合片3cを基板4の係止孔4bに挿入して係止させることで簡単に組立てられる。この組立状態において作動体2は抑え板3と基板4との間で不動に挟持され、作動体2の導退部2bと基板4の退極部4aとは所定間隔をおいて対峙している。5

一方、操作体10は、抵抗器本体1の上方において、中央下部に設けられた軸11を図示省略のブレケット等によって回転自在に軸支されている。また、操作体10は作動体2の各被押圧部2aに夫々対応する矩形状の押圧部12を下面に有しており、各押圧部32には非押圧状態でガタ防止用格状突起2cの上端が夫々当接している。10

次に第3図を参照して前述の可変抵抗器の動作について説明する。

図において操作体10の上面左側を指先等で押圧し、該操作体10を軸11を中心として反時計回り方向に傾動させると、まず左側の押圧部1215

に当接するガタ防止用棒状突起2cが撓み、やがて該押圧部12が被押圧部2aの上面に当接して被押圧部2aが下方に押圧されて変形し、被押圧部2aの下面側の導電部2bが電極部4aに接触する。導電部2bの接触面積は押圧力に伴って増加し、これにより電極部23aの導通抵抗が変化する。5

操作体10への押圧を解けば、作動体2の被押圧部2a及びガタ防止用棒状突起2cは自らの弾性で夫々元の状態に復元し、操作体10は再び棒状突起2cによって下面を支持されそのガタつきが防止される。10

このように前述の可変抵抗器では、作動体2の上面に各被押圧部2aに隣接して該被押圧部2aよりも高さ寸法の大きなガタ防止用の棒状突起2cを立設し、且つその上端を操作体10の各押圧部12に当接しているので、ガタ防止用棒状突起2cの高さ寸法にプラス側の誤差を生じた場合でも、該棒状突起2cが多少撓む程度で、被押圧部2aには非押圧状態で不当な押圧力が加わること15

# 公開実用平成 3-61304

がなく、これにより可変抵抗器に所期の抵抗変化を得ることができる。また、ガタ防止用棒状突起 2c の高さ寸法をマイナス側の誤差分を考慮してため大きめに形成しておくことが可能になるので、棒状突起 2c の上端を操作体 10 の押圧部 12 に的確に当接させて操作体 10 のガタつきを確實に防止することができる。

尚、前記実施例ではシーソータイプの可変抵抗器に本考案を適用したものを見たが、被押圧部が 1 個または 3 個以上の他のタイプの可変抵抗器チでも本考案を適用できることは勿論である。また、電極部 4d として抵抗膜を用いたものを示したが、従来例と同様の感圧導電材を用いた電極部を使用してもよい。更に、ガタ防止用の突起を棒状に形成したものを見たが、該突起の形状は押圧部に当接し、且つガタを防止できるものであれば種々採用できる。

## (考案の効果)

以上詳述したように、本考案によれば、ガタ防止用突起の高さ寸法にプラス側の誤差を生じた場

合でも、該突起が多少機能する程度で、作動体の被押  
圧部には非押圧状態で不当な押圧力が加わること  
がなく、これにより可変抵抗器に所期の抵抗変化  
を得ることができる。また、ガタ防止用突起の高  
さ寸法をマイナス側の誤差分を考慮して予め大き  
めに形成しておくことが可能になるので、該突起  
の上端を操作体の押圧部に的確に当接させて操作  
体のガタつきを確實に防止することができる。  
5

#### 4. 図面の簡単な説明

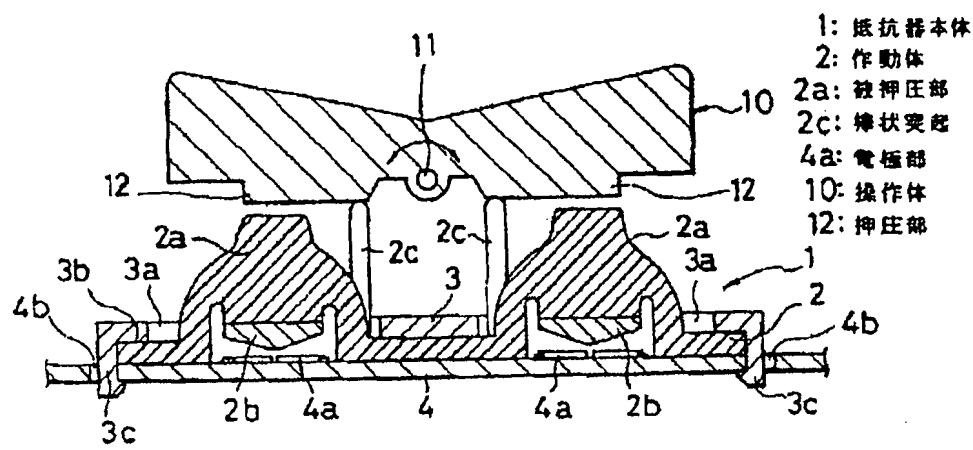
第1図乃至第3図は本考案をシーソータイプの  
可変抵抗器に適用した実施例を示すもので、第1  
図は可変抵抗器の断面図、第2図は抵抗器本体の  
上面図、第3図は動作説明図、第4図は従来の可  
変抵抗器の断面図である。  
10

図中、1…抵抗器本体、2…作動体、2a…被  
押圧部、2c…ガタ防止用の棒状突起、4a…電  
極部、10…操作体、12…押圧部。  
15

実用新案登録出願人 横浜ゴム株式会社

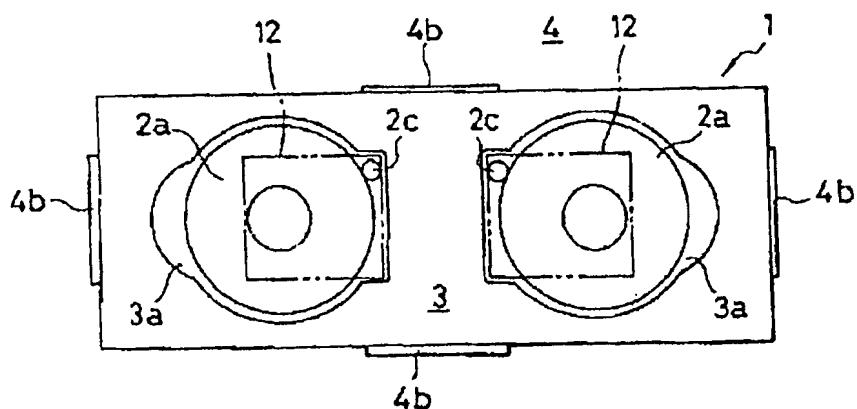
代理人 弁理士 吉田 精孝

公開実用平成 3-61304



可変抵抗器の断面図

第1図



抵抗器本体の上面図

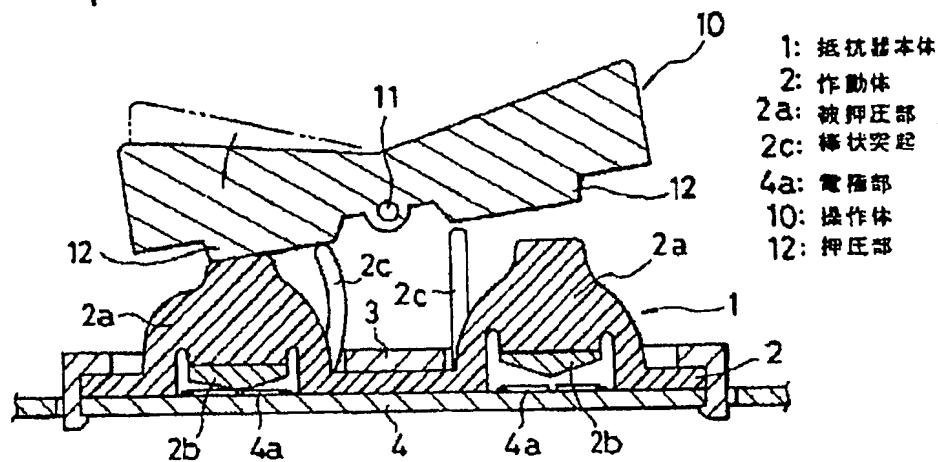
第2図

39

出願人 横浜ゴム株式会社

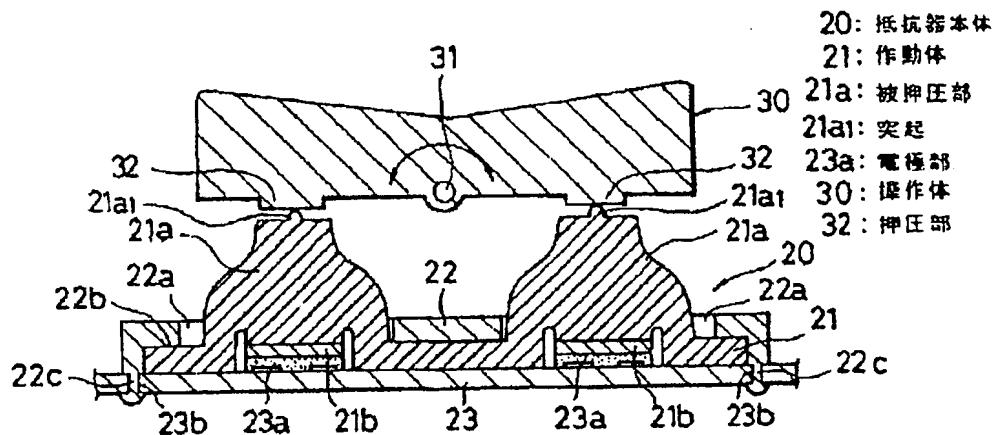
代理人 吉田精孝

実用3-61304



動作説明図

第 3 図



従来の可変抵抗器の断面図

第 4 図

40

出願人 横浜ゴム株式会社  
 代理人 吉田、精孝  
 特許 3 - 61304

**JAPANESE LAID-OPEN UTILITY  
MODEL APPLICATION  
H3-61304 (1991)**

(19) Japan Patent Office (JP)

(11) Publication No. H3-61304

(12) Published Laid-Open Utility Model (U)

(43) Publication Date June 17, 1991

(51) Int. Cl.<sup>5</sup>

Identification

In-House Reference

| Code | Number |
|------|--------|
|------|--------|

|              |   |         |
|--------------|---|---------|
| H 01 C 10/00 | B | 2117-5E |
|--------------|---|---------|

|       |   |         |
|-------|---|---------|
| 10/10 | Z | 2117-5E |
|-------|---|---------|

No examination request

Number of claims 1 (totally pages)

---

(54) Title of the Design

**VARIABLE RESISTOR**

(72) Designer

Yoichi KAWASHIMA

13-5-306, Hamamihira

Chigasaki-shi, Kanagawa-ken

(71) Applicant

Yokohama Rubber Co., Ltd.

5-36-11, Shimbashi, Minato-ku

Tokyo

(74) Agent

Seitaka YOSHIDA, Attorney

# Specification

## 1. Title of the design

Variable Resistor

## 2. Claims

A variable resistor comprising a resistor main body for changing the conductive resistance of electrode parts with the press deformation of covered pressed parts of an acting body made of an elastic material and an operating body having pressing parts capable of pressing the pressed parts is characterized by vertically providing shake prevention projections made of an elastic material adjacent to the pressed parts of the acting body, have a larger height dimension than the pressed parts and their upper ends contacting the pressing parts of the operating body.

## 3. Detailed description of the design

### (Field of industrial application)

The present design relates to a modification of a variable resistor for changing the conductive resistance of electrode parts with the press deformation of pressed parts via an operating body, and relates particularly to a variable resistor that may prevent shaking of the operating body.

### (Prior art)

A variable resistor shown in Fig. 4 has been known as this kind of variable resistor before.

This variable resistor is a seesaw type resistor having two electrodes and is constituted from a resistor main body 20 and an operating body 30 for the press operation.

The resistor main body 20 comprises an acting body 21 receiving the press operation, a pressure plate 22 and a base board 23.

The acting body 21 is formed of an elastic material such as synthetic rubber, etc. in the shape of a rectangular plate and has two hill-like pressed parts 21a on its upside. The upper ends of the two hill-like pressed parts 21a are flat and have projections 21a1 for preventing shaking of the operating body 30 at the center of its upside. Disc-like conductive parts 21b made of a con-

ductive rubber, etc. are coaxially attached downside of acting body 21 corresponding to the projections 21a1.

The pressure plate 22 covers the upside of acting body 21, has holes 22a for inserting the pressed parts 21a on it and has pressing surface 22b in contact with the rim upside of acting body 21 on the inner side. Multiple stop pins 22c longer than the thickness of base board 23 are formed downside of pressure plate 22.

The base board 23 comprises a printed wiring board, etc. and has electrode parts 23a capable of making contact with the conductive parts 21b of acting body 21 at two locations. Electrode parts attached to pressure-sensing conductive material, such as pressure-sensing conductive rubber, etc. upside of a pair of electrodes are used as these electrode parts 23a. Stop holes 23b capable of inserting stop pins 22c of pressure plate 22 are formed on the base board 23.

The resistor body 20 is assembled by mounting the acting body 21 on the base board 23, inserting the stop pins 22c of pressure plate 22 into the stop holes 23b of base board 23 so as to cover the acting body 21, melting or collapsing the projections of the stop pins 22c protruding downside of base board 23 to secure the pressure plate 22 to the base board 23. In this assembled state, the acting body 21 is fixedly held between the pressure plate 22 and the base board 23, bringing the conductive parts 21b of acting body 21 and the electrode parts 23a of base board 23 into contact.

On the other hand, the operating body 30 is rotatably pivoted on a shaft 31 provided in the central lower part above the resistor main body 20 by a bracket omitted in the graphical presentation. The operating body 30 has pressing parts 32 corresponding to the downside pressed parts 21a of acting body 21, and the projections 21a1 for shake prevention upside of pressed parts 21a are in contact with the pressing parts 32 in the non-pressed state, respectively.

In the variable resistor thus constituted, when the pressed parts 21a of acting body 21 are pressed downward and deformed by tilting with the shaft 31 of operating body 30 as the center, the conductive resistance of electrode parts 23a changes with the pressure force.

#### (Problem overcome by the design)

In the prior variable resistor, gaps formed between the pressing parts 32 and the pressed parts 21a of acting body 21 are absorbed by the projections 21a1 for shake prevention in the state of mounting the operating body 30, but the projections 21a1 are formed on the upside (pressed side) of

pressed parts 21a, therefore, if a plus-side error in height dimension of the projection themselves exists, there is the problem that the pressed parts 21a receive an improper press force in the non-pressed state, and an anticipated resistance change is not obtained in the variable resistor. Similarly, if a minus-side error in the height dimension of the projection exists, there is the problem that gaps are formed and shaking is generated in the operating body 30.

The present design was made in view of the above problem, and its purpose is to provide a variable resistor that can reliably prevent shaking in the operating body 30 without causing a hindrance in the characteristic resistance value of the variable resistor.

#### (Problem resolution means)

To achieve the above purpose, the present design is a variable resistor which comprises a resistor main body for changing the conductive resistance of electrode parts with the press deformation of the pressed parts of an acting body made of an elastic material and an operating body having pressing parts capable of pressing the pressed parts and is characterized by vertically providing projections for shake prevention made of an elastic material adjacent to the pressed parts of the acting body, have a larger height dimension than the pressed parts and have their upper ends in contact with the pressing parts of the operating body.

#### (Functions)

According to the present design, the projections for shake prevention which have a larger height dimension than the pressed parts and their upper ends are in contact with the pressing part of the operating body are vertically provided in positions different from the pressed parts, therefore an improper pressure force is not applied to the extruded parts even if a large height dimension of the projections is formed by considering the minus-side error portion.

#### (Example)

Fig. 1 to Fig. 3 show an example in which the present design is applied to a seesaw type variable resistor, Fig. 1 is the sectional view of the variable resistor, Fig. 2 is the top view of a resistor main body, and Fig. 3 is the illustrative drawing of operations.

The variable resistor of this example shown in Fig. 1 and Fig. 2 is constructed from a resistor main body 1 and an operating body 10 for press operations.

The resistor main body 1 comprises an acting body 2 receiving the press operation , a pressure plate 3 and a base board 4.

The acting body 2 is formed of an elastic material such as synthetic rubber, etc. in the shape of a rectangular plate and has two hill-like pressed parts 2a with flat upper ends on its upside. Conical conductive parts 2b made of a conductive rubber, etc. are coaxially attached downside of acting body corresponding to the projections 2c (wrong number "2a"? , translator). Rod-like projections 2c for shake prevention which are adjacent to the pressed parts 2a and have a larger height dimension than the pressed parts 2a are provided vertically and integrally with the acting body 2, respectively.

The pressure plate 3 covers the upside of acting body 2, has roughly circular holes 3a, through which the pressed parts 2a and the rod-like projections 2c are inserted on the upside and have the pressing surface 3b in contact with the upside of acting body 2 on the inner side. Engagement pieces 3c which are longer than the thickness of base board 4 and have a hooklike engagement at the lower end are vertically provided at each side of the pressure plate 3.

The base board comprises a printed wiring board, etc. and has electrode parts 4a for which the conductive parts 2b of acting body 2 is contactable at two locations on its upside. Electrode parts in which two semi-circular resistance films are arranged in the non-contact state and electrodes are connected to the resistance films are used as the electrode parts 4a. Engagement holes 4b through which the engagement pieces 3c of pressure plate 3 can be inserted and engaged are formed corresponding to the engagement pieces.

This resistor main body 1 is simply assembled by mounting the acting body 2 on the base board 4, inserting the engagement pieces 3c of pressure plate 3 into the engagement holes 4b of base board 4 and stopping them so as to cover the acting body 2. In the assembled state, the acting body 2 is fixedly held between the pressure plate 3 and the base board 4, and the conductive parts 2b of acting body 2 and the electrode parts 4a of base board 4 are opposite at a prescribed spacing.

On the other hand, in the operating body 10 is rotatably pivoted above the resistor main body 1 on a shaft 11 provided in the central lower part by a bracket omitted in the graphical presentation. The operating body 10 has rectangular pressing parts 12 corresponding to the pressed parts 2a of acting body 2, respectively, the upper ends of the rod-like projections 2c for shake prevention are in contact with the pressing parts 12 in the non-extruded state, respectively.

Operations of the above-mentioned variable resistor are described next with reference to Fig. 3.

In Fig. 3, if the top left side of the operating body 10 is pressed with a finger tip, etc., the operating body 10 is tilted in the counterclockwise direction with the shaft 11 as center, first the rod-like projections 2c for shake prevention in contact with the left-side pressing part 12 flex, shortly the pressing part 12 makes contact upside of the pressed part 2a, the pressed part 2a is pressed down and deformed, and the conductive parts 2b on the downside of pressed parts 2a makes contact with the electrode parts 4a. The contact area of the conductive parts 2b increases with the pressure force, changing the conducting resistance of electrode parts 23a.

If the pressing onto the operating body 10 is released, the pressed parts 2a of acting body 2 and the rod-like projections 2c for shake prevention are restored to the original state by their own elasticity, respectively, and the downside of operating body 10 is supported by the rod-like projections 2c again to prevent shaking.

Thus, in the above-mentioned variable resistor, the rod-like projections 2c for shake prevention adjacent to the pressed parts 2a and have a larger height dimension than the pressed parts 2a are vertically provided upside of acting body 2 and their upper ends make contact with the pressing parts 12 of operating body 10. Therefore, even when a plus-side error in height dimension of the rod-like projections 2c for shake prevention is generated, the rod-like projections 2c flex more or less, and improper press force is not applied to the pressing parts 12 in the non-pressed state, thereby obtaining anticipated resistance change in the variable resistor, making it possible to form a large height dimension of the rod-like projections 2c for shaking prevention beforehand by considering a minus-side error portion, accurately bringing the upper ends of the rod-like projections 2c into contact with the pressing parts 12 of operating body 10 to reliably prevent shaking of operating body 10.

The case of applying the present design to the seesaw type variable resistor was shown in the above example. However, the present design may also be applied in other types of variable resistors with one, three or more pressed parts. Moreover, electrode parts using a resistance film were shown as the electrode parts 4a, but electrode parts using a pressure-sensing conductive material the same as

in the prior example may also be used. Furthermore, the case of forming the projections for shake prevention in the shape of rod was shown, but various shapes of projections may be adopted if the projections are in contact with the pressing parts and may prevent the shaking.

#### (Efficacy of the design)

As described in detail above, according to the present design, the projections for shake prevention flex more or less and an improper press force is not applied to the pressing parts of the acting body in the non-pressed state, thereby obtaining anticipated resistance change in the variable resistor even if a plus-side error in the height dimension of projections is generated. Moreover, it becomes possible to form a large height dimension of projections beforehand by considering a minus-side error, therefore the upper ends of the projections may be accurately brought into contact with the pressing parts of operating body to reliably prevent shaking of the operating body.

#### 4. Brief description of the drawings

Fig. 1 to Fig. 3 show an example of applying the present design to a seesaw type variable resistor Fig. 1 is the sectional view of the variable resistor, Fig. 2 is a top view of a resistor main body, Fig. 3 is the illustrative drawing of operations, and Fig. 4 is the sectional view of the prior variable resistor.

In the drawings,

- 1 resistor main body
- 2 acting body
- 2a pressed body
- 2c rod-like projection for shake prevention
- 4a electrode part
- 10 operating body
- 12 pressing part

- 1** resistor main body
- 2** acting body
- 2a** pressed body
- 2c** rod-like projection for shake prevention
- 4a** electrode part
- 10** operating body
- 12** pressing part

Sectional view of variable resistor

[Fig. 1]

Top view of resistor main body

[Fig. 2]

- 1** resistor main body
- 2** acting body
- 2a** pressed body
- 2c** rod-like projection for shake prevention

- 4a electrode part
- 10 operating body
- 12 pressing part

Illustrative drawing of operations

[Fig. 3]

- 20 resistor main body
- 21 acting body
- 21a pressed body
- 21a1 projection
- 23a electrode part
- 30 operating body
- 32 pressing part

Sectional view of prior variable resistor

[Fig. 4]

CERTIFICATE OF TRANSLATION

I Roger P. Lewis, whose address is 42 Bird Street North, Martinsburg WV 25405, declare and state the following:

I am well acquainted with the English and Japanese languages and have in the past translated numerous English/Japanese documents of legal and/or technical content.

I hereby certify that the Japanese translation of the attached translation of documents identified as:

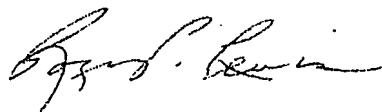
Utility Model Application

H3-61304

"Variable Resistor"

is to the best of my knowledge and ability true and accurate.

I further declare that all statements contained herein of our own knowledge, are true, that all statements of information and belief are believed to be true.



ROGER P. LEWIS

October 24, 2006



**PROSPETTO A**

**RIASSUNTO INVENZIONE CON DISEGNO PRINCIPALE, DESCRIZIONE E RIVENDICAZIONE**

NUMERO DOMANDA I/MI/SI/A/003315 REG. B

DATA DI DEPOSITO 10/10/1981

NUMERO BREVETTO  

DATA DI RILASCIO 10/10/1981

**D. TITOLO**

TASTIERA A RETROAZIONE TATTILE A VIBRAZIONE

**L. RIASSUNTO**

Tastiera di comando per apparecchiature elettriche od elettroniche in cui la retroazione dell'avvenuto comando viene inoltrata allo operatore mediante vibrazione del tasto stesso.

**M. DISEGNO**

U. P. I. C. A.  
BREVETTI  
11 DIC. 1981

MI 91 A/033 15

*Marcio Zukin*

DESCRIZIONE DI INVENZIONE INDUSTRIALE

Descrizione dell'INVENZIONE INDUSTRIALE dal  
titolo: "TASTIERA A RETROAZIONE TATTILE A  
VIBRAZIONE" a nome dei Sigg.

Zukin Marcio nato a Rio De Janeiro -Brasile- il  
01/03/1966 residente a Milano in via Popoli Uniti

20

Ranzani Paolo nato a Milano il 13/10/1963

residente a Milano in via Fornari 10

RIASSUNTO

Tastiera di comando per apparecchiature  
elettriche/elettroniche in cui la retroazione  
dell'avvenuto comando, viene inoltrata  
all'operatore mediante vibrazione del tasto  
stesso.

STATO ATTUALE DELLA TECNICA

Sono note le tastiere o pulsantiere di comando che  
quotidianamente vengono azionate nelle piu'  
diverificate applicazioni: calcolatrici,  
telefoni, ascensori, distributori automatici,  
elettrodomestici etc.

Le attuali tastiere presentano tipologie  
costruttive variabili anche in funzione della  
applicazione; si hanno pertanto tastiere a

*Luca G. Fulani*

microinterruttori, a membrana, capacitive etc.

Elemento essenziale dell'apparecchiatura e' un contatto, meccanico od elettronico, che viene chiuso, ovvero messo in conduzione, quando il tasto viene premuto dall'operatore.

L'informazione che il tasto e' stato effettivamente premuto puo' pervenire all'operatore in diversi modi: rumore meccanico del tasto, segnalazione acustica, segnalazione luminosa, innesco delle operazioni comandate dal tasto, etc.

In applicazioni di largo consumo od in ambienti industriali particolarmente ostili, si preferisce utilizzare tastiere a membrana o capacitive per la loro maggiore resistenza meccanica ed alla penetrazione di agenti esterni come polvere, umidita', trucioli di lavorazione.

Tali tastiere non danno una retroazione "meccanica" a causa della loro tecnologia costruttiva, si deve pertanto ricorrere alla segnalazione acustica o luminosa.

Nel caso in cui l'operatore sia non udente o non vedente o comunque si trovi in ambienti rumorosi o malamente illuminati, egli non puo' definire con

*Mancato comando*  
certezza l'avvenuto comando.

Il ritrovato in oggetto elimina o riduce i suddetti inconvenienti risolvendo anche completamente alcuni problemi come qui di seguito illustrato.

#### DESCRIZIONE DEL RITROVATO

Secondo il ritrovato si prevede una risposta all'operatore mediante la vibrazione del tasto premuto.

La retroazione agisce pertanto sul tatto dell'operatore, lasciando liberi, se efficienti, gli altri sensi.

Secondo una struttura preferenziale, il ritrovato si presenta come una normale tastiera a membrana sotto alla quale vengono applicati dei trasduttori piezoelettrici, che, eccitati ad una opportuna frequenza, mettono in vibrazione il tasto stesso.

In una variante si prevede che lo stesso trasduttore piezoelettrico funzioni contemporaneamente anche da tasto, in quanto esso genera una tensione proporzionale alla sollecitazione meccanica applicata.

Allo scopo di rendere idoneo il ritrovato anche ad applicazioni già esistenti, il trasduttore

*Maurizio*

potrebbe essere posizionato anche sul lato  
anteriore del tasto.

#### VANTAGGI

Sono evidenti i vantaggi del ritrovato.

Con una tastiera avente aspetto esteriore uguale a  
quello dei modelli esistenti, si allarga la  
possibilità di uso di certe apparecchiature anche  
a persone handicappate o l'uso di apparecchiature  
in ambienti particolarmente ostili.

All'operatore non viene richiesta nessuna  
attenzione particolare e l'uso del ritrovato non  
presenta complicazioni aggiunte.

Ovviamente sono innumerevoli le varianti possibili.

Ad esempio al posto di un trasduttore  
piezoelettrico se ne puo' usare uno di tipo  
magnetodinamico, o di tipo magnetostrettivo.

Pertanto deve essere inteso che nella domanda di  
privativa sia compresa ogni equivalente  
applicazione dei concetti ed ogni equivalente  
prodotto attuato e/o operante secondo una o piu'  
qualsiasi delle caratteristiche indicate nelle  
seguenti:

RIVENDICAZIONI

manca 2 linea

- 1) Tastiera a retroazione caratterizzata da cio' che la retroazione viene inviata all'operatore mediante azione vibratoria del tasto stesso.
- 2) Tastiera a retroazione come alla rivendicazione 1), caratterizzata da cio' che la vibrazione inizia dopo che il tasto e' stato effettivamente premuto.
- 3) Tastiera a retroazione come alle rivendicazioni 1) e 2), caratterizzata da cio' che la vibrazione viene generata da un trasduttore piezoelettrico.
- 4) Tastiera a retroazione come alle rivendicazioni da 1) a 3), caratterizzata da cio'che il trasduttore piezoelettrico viene pilotato da un circuito elettronico.
- 5) Tastiera a retroazione come alle rivendicazioni da 1) a 4), caratterizzata da cio'che la tastiera ha forme usuali e pertanto e' di uso istintivo.
- 6) Tastiera a retroazione come alle rivendicazioni da 1) a 5), caratterizzata da cio'che il trasduttore puo' essere anche di tipo differente.
- 7) Tastiera a retroazione come alle rivendicazioni da 1) a 6), caratterizzata da cio'che il trasduttore puo' essere posizionato anche sulla faccia anteriore della tastiera.
- 8) Tastiera a retroazione come alle rivendicazioni da 1) a 7), caratterizzata da cio'che il

*Maurizio Ziliani*

trasduttore stesso puo' fungere da tastiera.

9) Tastiera a retroazione come alle rivendicazioni da 1) a 8), caratterizzata da cio'che l'innesto della vibrazione puo' essere determinato dalla effettiva attuazione della operazione legata alla pressione del tasto.

10) Tastiera a retroazione come alle rivendicazioni da 1) a 9), caratterizzata da cio'che la frequenza di vibrazione del tasto puo' essere differenziata per indicare diversi tipi di azione.

11) Tastiera a retroazione come alle rivendicazioni da 1) a 10), caratterizzata da cio'che il trasduttore sia applicato alla tastiera mediante incollaggio od altro mezzo.

12) Tastiera a retroazione come alle rivendicazioni da 1) a 11), caratterizzata da cio'che il circuito elettronico di pilotaggio del trasduttore sia montato su una scheda separata.

13) Tastiera a retroazione come alle rivendicazioni da 1) a 12), caratterizzata da cio'che il circuito elettronico di pilotaggio venga integrato nel trasduttore stesso.

14) Tastiera a retroazione come alle

*Maurizio*

rividicazioni da 1) a 13), caratterizzata da  
cio'che il sistema possa essere applicato anche su  
tastiere preesistenti.

Il tutto sostanzialmente come descritto ed  
illustrato e per gli scopi specificati.

*Maurizio Galli*



## DESCRIPTION OF AN INDUSTRIAL INVENTION

Description of the INDUSTRIAL INVENTION having the title: "KEYBORD WITH VIBRATING TACTILE FEEDBACK" to

Mr Zukin Marcio born in Rio De Janeiro - Brazil - on 01/03/1966 resident in Milan at via Popoli Uniti 20

Mr Ranzani Paolo born in Milan on 13/10/1963 resident in Milan at via Fornari

10

### ABSTRACT

Command keyboard for electrical/electronic apparatuses in which the feedback of a command that has occurred is transmitted to the operator through vibration of the button itself.

### BACKGROUND OF THE INVENTION

Keyboards or keypads are known that are actuated daily in the most different applications: calculators, telephones, lifts, cash machines, domestic appliances, etc.

Current keyboards have variable embodiments also according to the application; therefore there are microswitch, membrane, capacitative keyboards, etc.

An essential element of the apparatus is a contact, mechanical or electronic, which is closed, i.e. made to conduct, when the button is pressed by the operator.

The operator can be informed that the button has actually been pressed in different ways: mechanical noise of the button, acoustic signal, light signal, triggering of the operations commanded by the button, etc.

In widely used applications or in particularly hostile industrial environments, it is preferred to use membrane or capacitative keyboards due to their greater mechanical strength and the penetration of impurities like dust, humidity and processing chips.

Such keyboards do not give "mechanical" feedback due to their constructive technology and therefore acoustic or light signals must be used.

In the case in which the operator is deaf or blind or in any case is in noisy or poorly lit environments, he cannot be certain of whether a command has occurred.

The invention in object eliminates or reduces the aforementioned drawbacks also completely solving some problems as illustrated hereafter.

#### DESCRIPTION OF THE INVENTION

According to the invention, a response to the operator through the vibration of the pressed button is foreseen.

The feedback therefore acts on the operator's sense of touch, leaving the other senses free, if they work.

According to a preferential structure, the invention is in the form of a normal membrane keyboard under which piezoelectric transducers are applied that, excited at a suitable frequency, make the button itself vibrate.

In a variant it is foreseen for the same piezoelectric transducer to simultaneously operate as a button, since it generates a voltage proportional to the mechanical stress applied.

In order to make the invention also suitable for applications that already exist, the transducer could also be positioned on the front side of the button.

#### ADVANTAGES

The advantages of the invention are clear.

With a keyboard having the same appearance as existing models, the possibility of using certain apparatuses is extended to handicapped people or it becomes possible to use apparatuses in particularly hostile environments.

The operator does not have to pay any special attention and the use of the invention has no additional complications.

Obviously, the possible variants are numerous. For example, instead of a piezoelectric transducer, a magnetodynamic or magnetostrictive transducer can be used.

Therefore, it should be understood that the patent application covers any equivalent application of the concepts and any equivalent product made and/or operating according to any one or more of the characteristics indicated in the following:

## CLAIMS

- 1) Keyboard with feedback characterized in that the feedback is sent to the operator through vibration of the button itself.
- 2) Keyboard with feedback according to claim 1), characterized in that the vibration begins after the button has actually been pressed.
- 3) Keyboard with feedback according to claims 1) and 2), characterized in that the vibration is generated by a piezoelectric transducer.
- 4) Keyboard with feedback according to claims 1) to 3), characterized in that the piezoelectric transducer is controlled by an electronic circuit.
- 5) Keyboard with feedback according to claims 1) to 4), characterized in that the keyboard is the normal shape and is therefore instinctive to use.
- 6) Keyboard with feedback according to claims 1) to 5), characterized in that the transducer can also be of a different type.
- 7) Keyboard with feedback according to claims 1) to 6), characterized in that the transducer can also be positioned on the front face of the keyboard.
- 8) Keyboard with feedback according to claims 1) to 7), characterized in that the transducer itself can act as a keyboard.
- 9) Keyboard with feedback according to claims 1) to 8), characterized in that the triggering of the vibration can be brought about by the actual actuation of the operation linked to the pressing of the button.
- 10) Keyboard with feedback according to claims 1) to 9), characterized in that the frequency of vibration of the button can be differentiated to indicate different types of action.
- 11) Keyboard with feedback according to claims 1) to 10), characterized in that the transducer is applied to the keyboard through gluing or another means.

12) Keyboard with feedback according to claims 1) to 11), characterized in that the electronic control circuit of the transducer is mounted on a separate board.

13) Keyboard with feedback according to claims 1) to 12), characterized in that the electronic control circuit is integrated in the transducer itself.

14) Keyboard with feedback according to claims 1) to 13), characterized in that the system can also be applied onto pre-existing keyboards.

All as substantially described and illustrated and for the specified purposes.